Integrated hydrological validation over complex terrain and coastal environments in Eastern Mediterranean

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Research Questions for Hydrologic GPM-GV

Outline

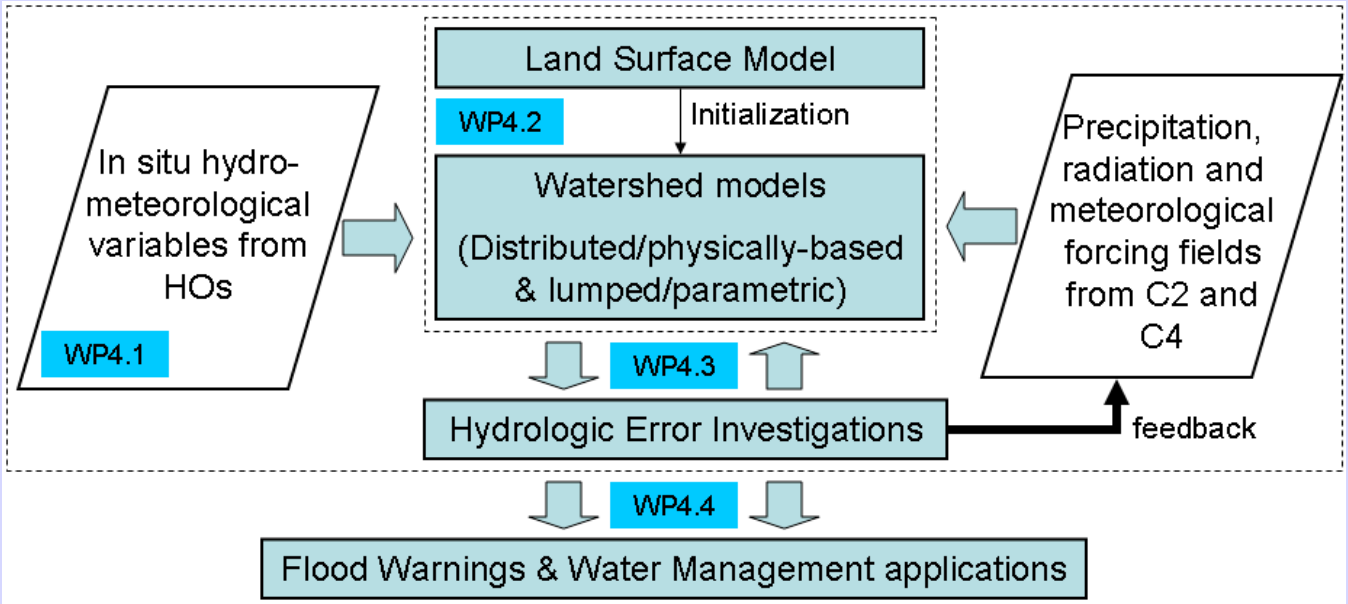
• **What is the current state of hydrological predictability from existing constellation of satellite precipitation observations and NWP forecasts, and what are the improvements through advances in satellite retrievals and NWP data assimilation?**
These questions will be addressed using hydrological error simulations for a variety of storm characteristics, scales, watershed types and climate regimes.

• **What are the optimal precipitation products (or combination of products) and resolutions in terms of prediction of various hydrological variables of interest (runoff, soil moisture, water & energy fluxes, etc.)?**
Current precipitation products from satellite retrievals and NWP outputs are in the range of 2-10 km & 0.5-3 hours. Retrieval and model prediction uncertainty increases in a complex way as resolution becomes finer. We need to investigate the complete responses of hydrological variables associated with the different precipitation product resolutions to produce ensembles of hydrological parameters.

• **What improvements are obtainable in the decision making process by using the satellite based products?**
The final goal in flood forecasting and management is to allow decision makers to take more reliable decisions. It is thus fundamental to see how the new satellite and NWP products can reduce the forecasting uncertainty and, consequently, improve the reliability of decisions.

Methodology

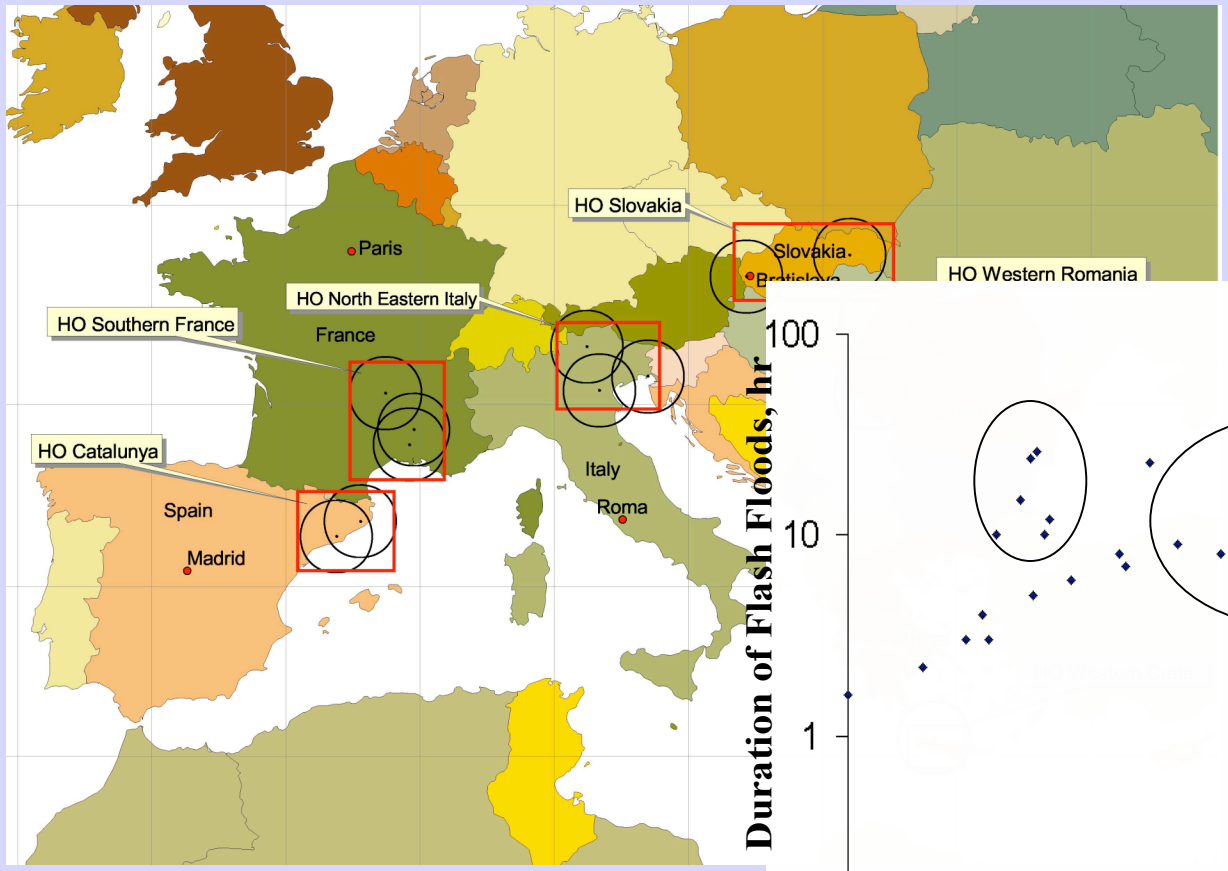
Outline

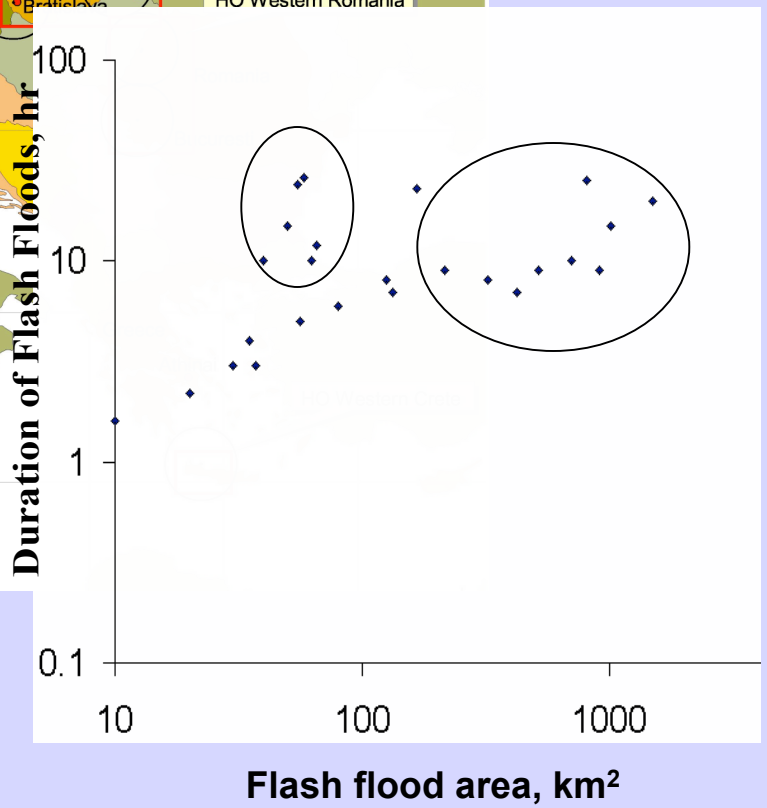


- Develop high-quality ground validation hydro-meteorological database.
- Integration of rainfall data with hydrological models (of varying complexity) for the prediction of floods and other hydo variables.
- Error propagation investigations for different storm, watershed and model characteristics.
- CRM/LSM based downscaling of precipitation products
- How do the results of integrated or hydrologic validation feedback to retrieval algorithms?

European HOs – HYDRATE project

Outline





HO North Eastern Italy – radar coverage

Outline

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Hydrologic Observatories

HO Northeast Italy

Coastal GV - POSEiDON

Synergies with others in GV community

Summary

Hydrologic model (tRIBS) simulations

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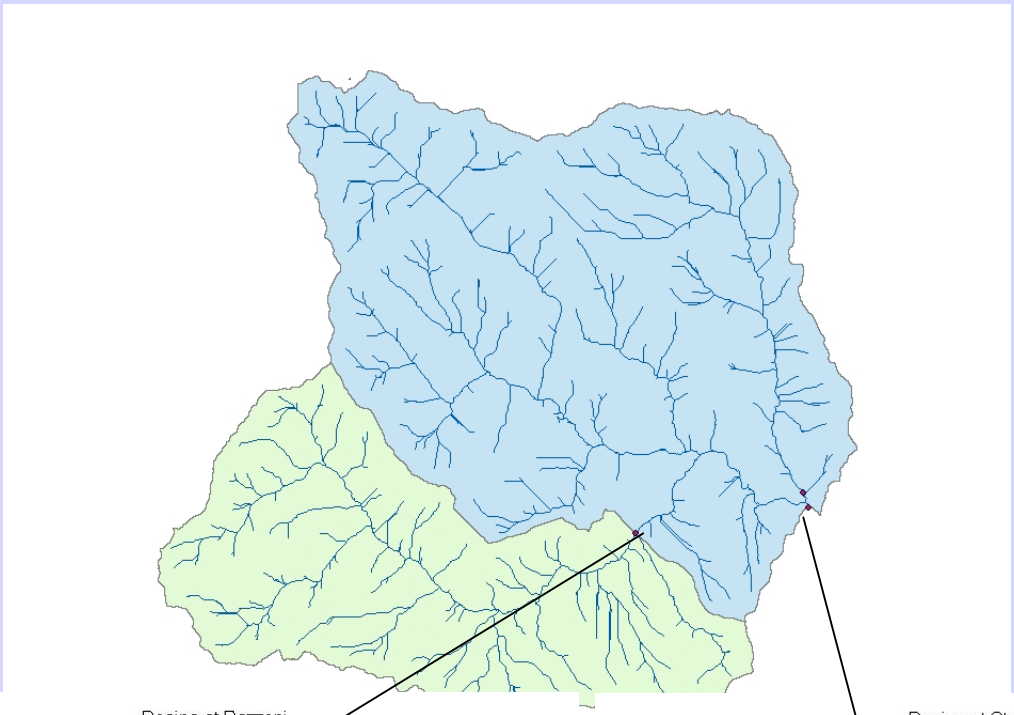

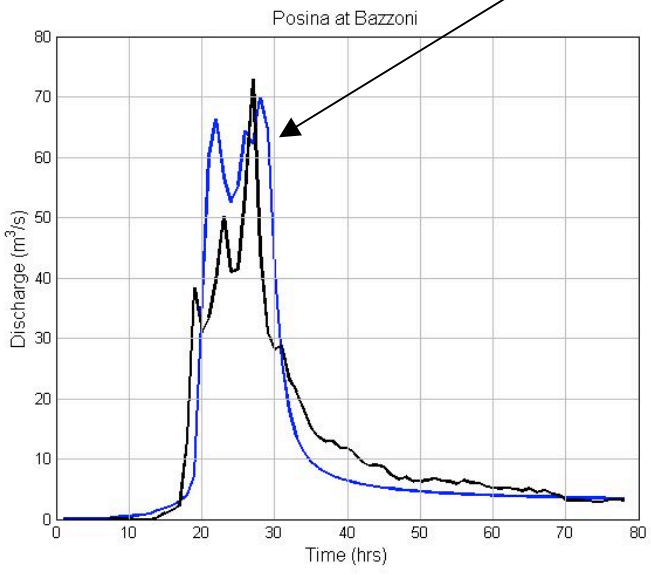

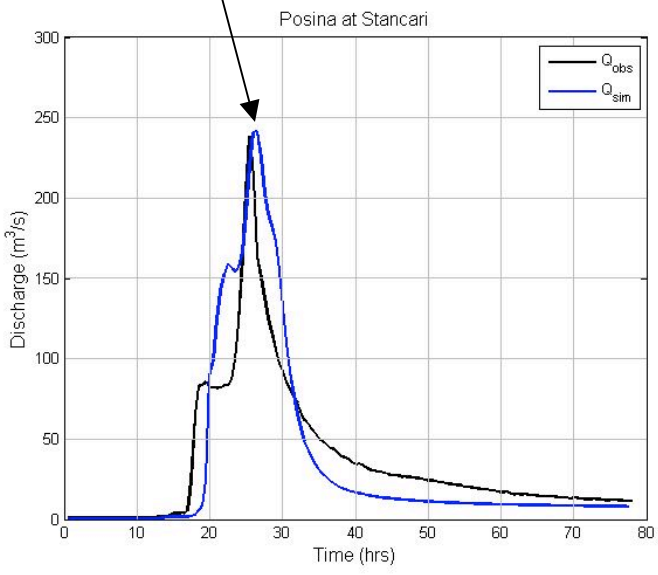

XPOL beam occlusions

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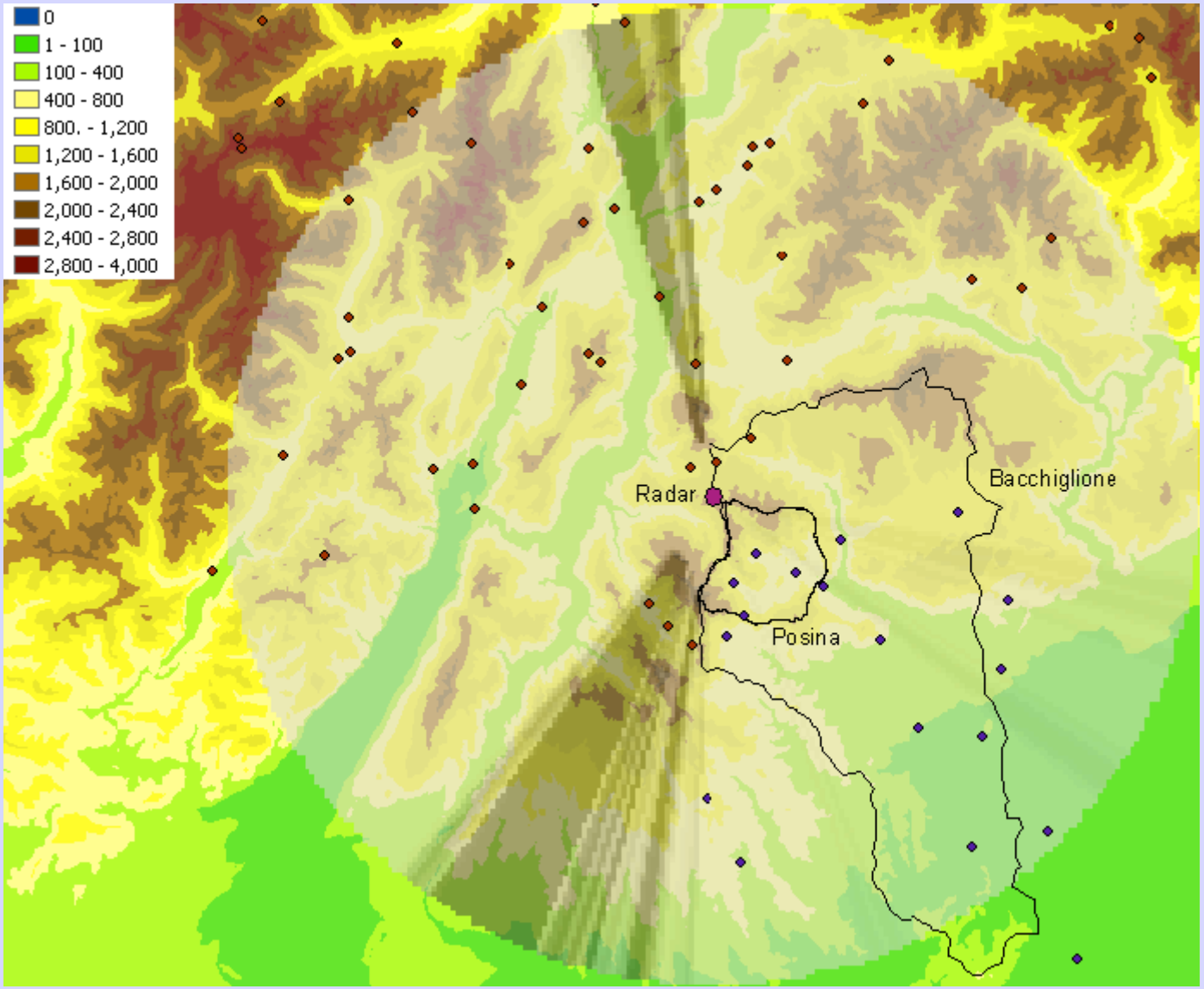
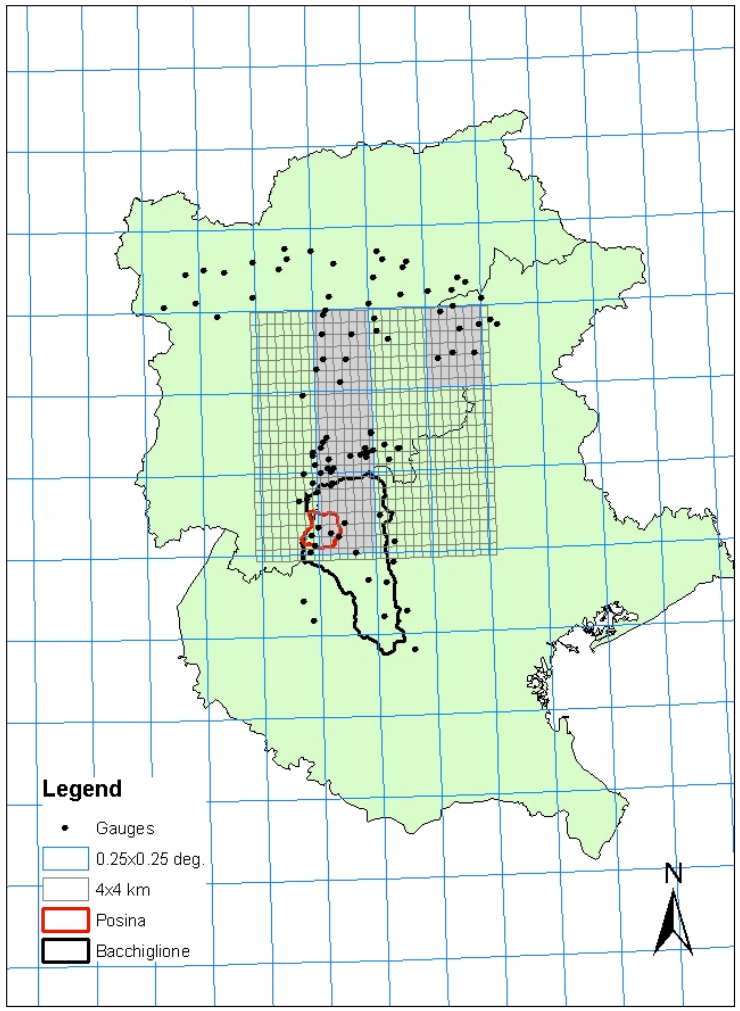


Satellite product scales

Outline



Satellite product scales
0.4 - 0.25 deg
½ hourly - 3 hourly

Is there a temporal or spatial scale below which it is simply not practical to worry about "validation" of the GPM satellite obs in the hydrologic realm?

Locally deployed XPOL – measurement

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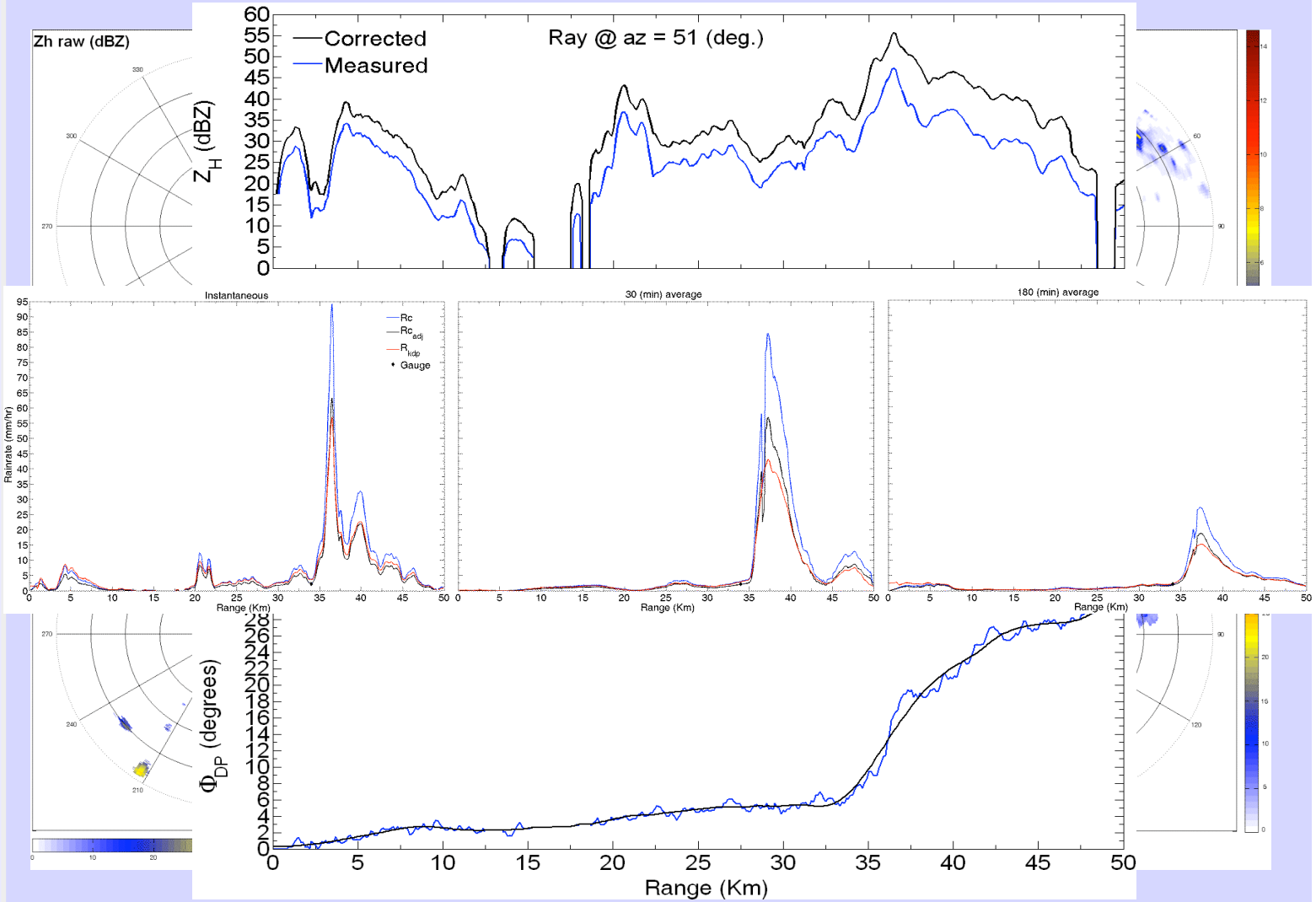

Rain accumulations

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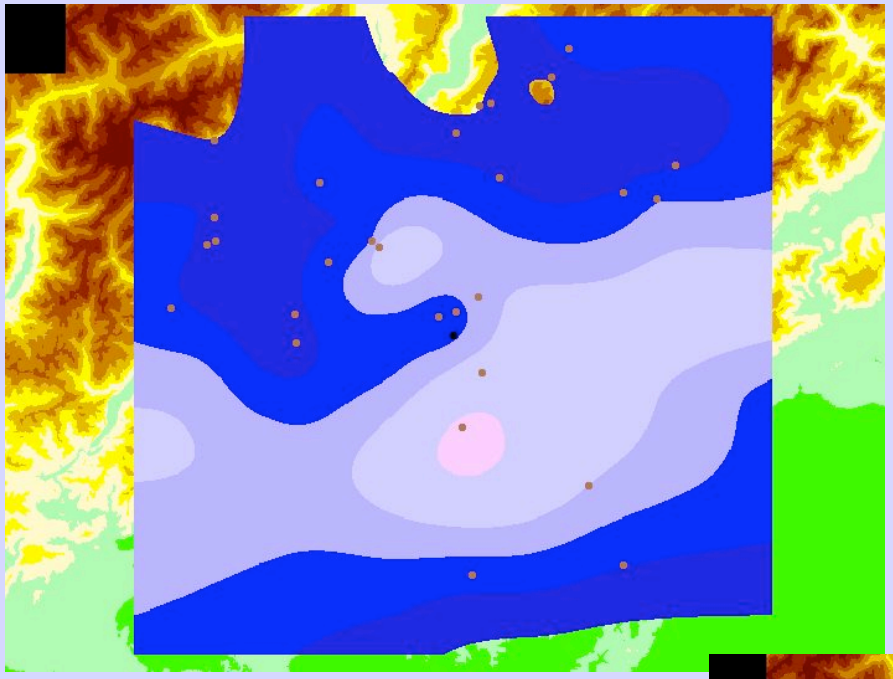

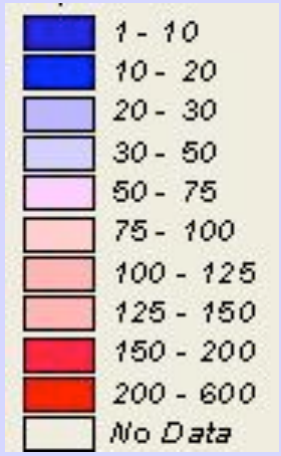

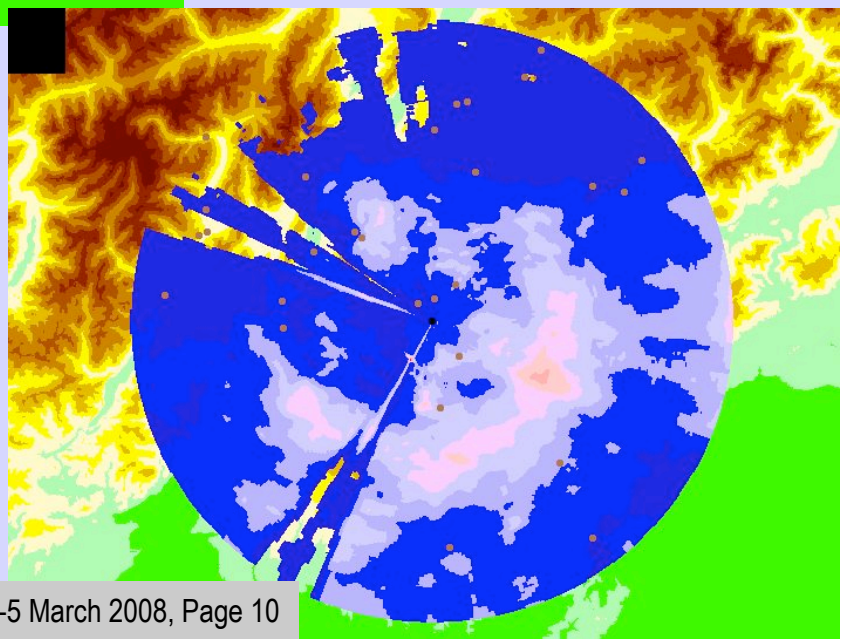

XPOL performance

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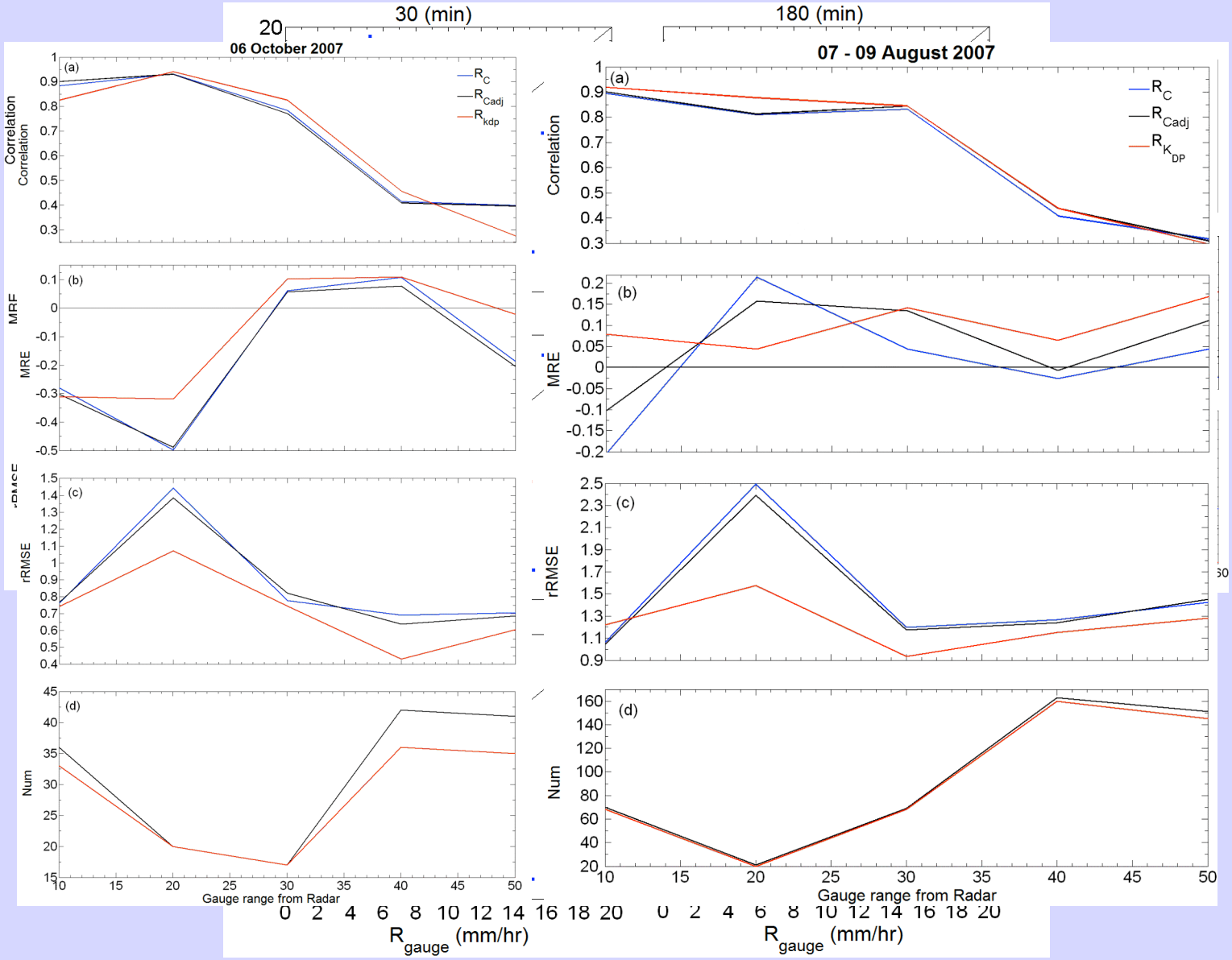

Coastal GV – POSEIDON project

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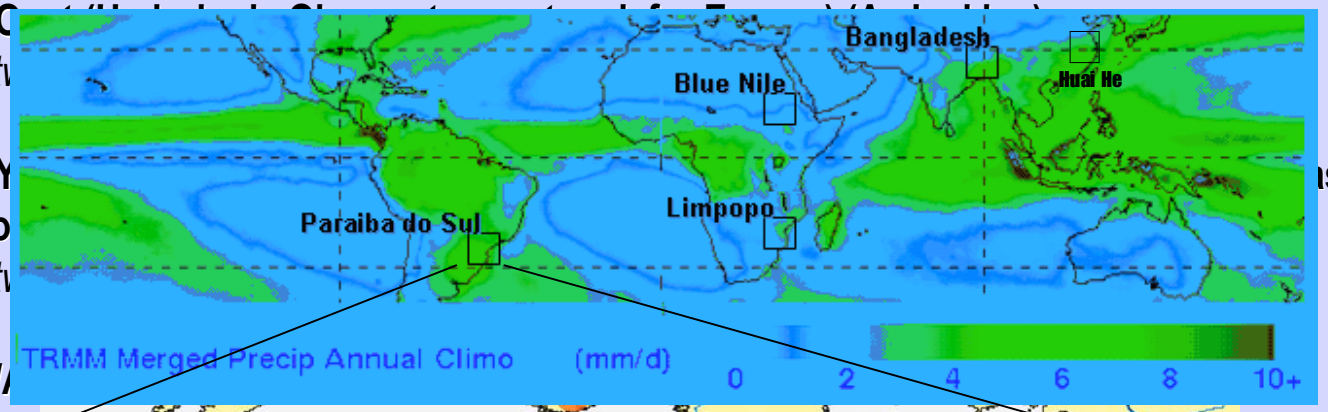

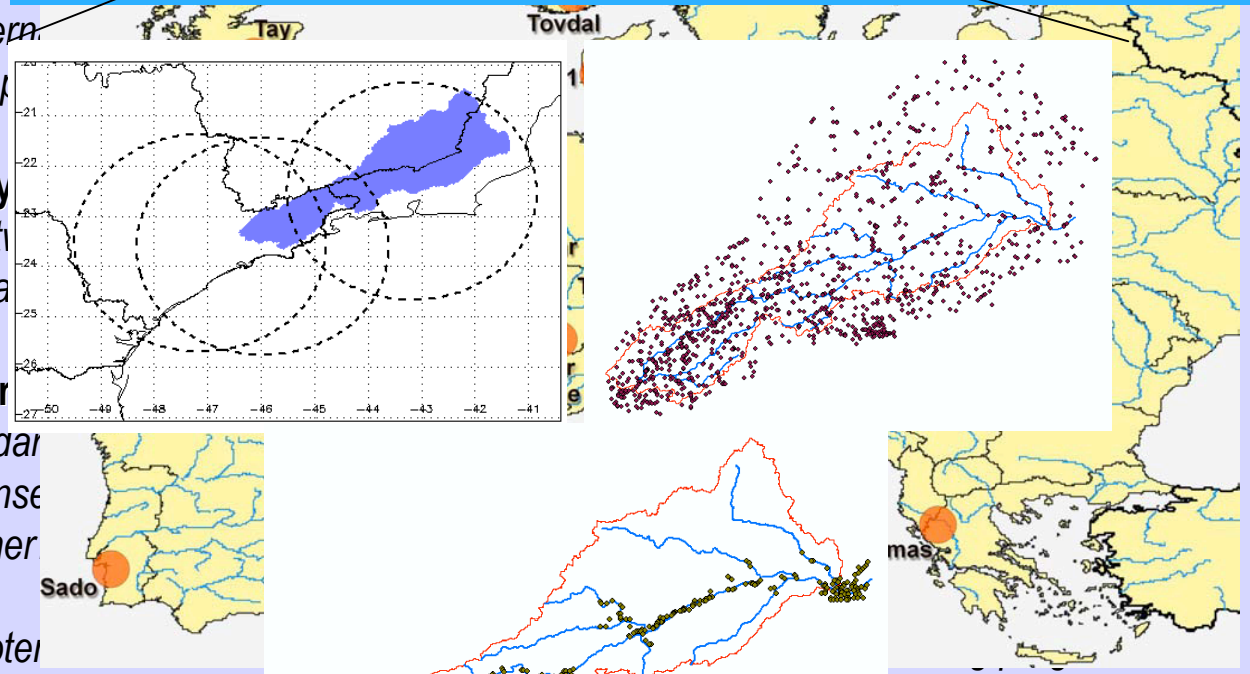

Summary & Recommendations for Collaboration

HO requirements

- **The HOs should capture a range of scales and watershed/storm characteristics**
- **The HOs should provide accurate/high-resolution ground measurements of rainfall variability and other hydrological variables (soil moisture, ET, runoff)**
- **GV rain measurement uncertainty; model complexity and data-modelling issues**

Collaborations

- **Leveraging with EU projects/research groups focusing on HO activities (HYDRATE & HOnet)**
- **Collaboration with international partners (Brazil, Ethiopia, SA)**
- **Research collaboration for the eastern Mediterranean (Greece, Cyprus, Turkey, Israel) on the basis of EU – INTEREG program**